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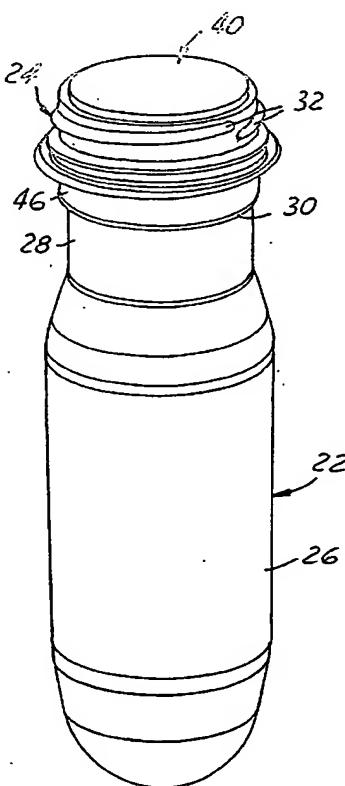
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(54) Title: CONTAINER PREFORM ASSEMBLY AND METHOD OF MANUFACTURE



(57) Abstract: A preform assembly (20) for blow molding a container includes a molded plastic preform (22) having an open mouth, a neck (28) surrounding the mouth with an external surface at a first diameter, an external flange (30) at one end of the neck surrounding the mouth, and a preform body (26) integrally molded with the neck at an end of the neck spaced from the flange. The preform body has a second external diameter that is greater than the first diameter of the neck external surface. A circumferentially continuous molded plastic finish ring (24) is externally secured over the external surface of the neck between the flange and the preform body. In the preferred embodiments of the invention, the finish ring is secured to the preform neck by expanding the ring over the flange, most preferably using a mandrel 40, and then allowing the ring resiliently to shrink onto the external surface of the neck.

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## **CONTAINER PREFORM ASSEMBLY AND METHOD OF MANUFACTURE**

The present invention is directed to preforms for blow molding plastic containers, and to methods of making such preforms.

### **Background and Summary of the Invention**

In the manufacture of plastic containers, it is conventional to injection mold or compression mold a container preform having a body and a neck finish with one or more external threads. The neck finish typically is molded to its final geometry, while the body of the preform is subsequently blow molded to the desired geometry of the container body. The preform may be of monolayer construction, or may be of multilayer construction in which one or more intermediate layers in the preform body may or may not extend into the finish area of the preform. U.S. Patents 4,609,516, 4,710,118 and 4,954,376 illustrate injection molding of multilayer container preforms.

Molding the neck finish portion of the container as part of the preform presents a number of problems. For example, when the preforms are formed by injection molding, the plastic material typically is injected into a mold cavity at the closed end of the preform body, so that the material must flow along the sides of the preform cavity into the area in which the neck finish is molded. The finish typically requires more accurate and stable dimensioning than the body of the preform, which may limit the cycle time of the molding process. Furthermore, the neck finish portion of the preform is of the same material as at least the outer layers of the preform body, which limits the ability to obtain the most desirable characteristics at the finish. When the preform is of polyester construction, such as polyethylene terephthalate (PET), the neck finish portion of the preform can be wholly or partially crystallized to improve the operating characteristics of the finish

area, particularly in hot-fill container applications. However, the requirement that the neck finish be of the same material as at least the outer layers of the preform body still limits the design capabilities of preform manufacture.

A preform assembly for blow molding a container in accordance with one aspect of the present invention includes a molded plastic preform having an open mouth, a neck surrounding the mouth with an external surface at a first diameter, an external flange at one end of the neck surrounding the mouth, and a preform body integrally molded with the neck at an end of the neck spaced from the flange. The preform body has a second external diameter that is greater than the first diameter of the neck external surface. A circumferentially continuous molded plastic finish ring is externally secured over the external surface of the neck between the flange and the preform body. In the preferred embodiments of the invention, the finish ring is secured to the preform neck by expanding the ring over the flange and then allowing the ring resiliently to shrink onto the external surface of the neck.

#### **Brief Description of the Drawings**

The invention, together with additional objects, features, advantages and aspects thereof, will be best understood from the following description, the appended claims and the accompanying drawings, in which:

FIG. 1 is perspective view of a preform assembly in accordance with one exemplary presently preferred embodiment of the invention;

FIG. 2 is a perspective view of the preform in the assembly of FIG. 1;

FIGS. 3 and 4 are perspective views that illustrate sequential stages of assembly of the preform assembly of FIG. 1; and

FIG. 5 is a fragmentary sectional view of a portion of FIG. 4.

#### Detailed Description of Preferred Embodiments

FIG. 1 illustrates a preform assembly 20 in accordance with one presently preferred embodiment of the invention as including a preform 22 and a separate finish ring 24 secured thereto. As best seen in FIG. 2, preform 22 includes a body 26 having a closed lower end. (Directional words such as "upper" and "lower" are employed by way of description and not limitation with respect to the upright orientation of the preform and assembly illustrated in the drawings. Directional words such as "radial" and "circumferential" are employed by way of description and not limitation with respect to the central axis of the preform neck or finish ring as appropriate.) A neck 28, which typically is cylindrical, integrally extends from the upper end of preform body 26, and a flange 30 extends radially outwardly from the open end of neck 28. Neck 28 and flange 30 surround the open mouth 31 of preform 22. Finish ring 24 is circumferentially continuous, and preferably has one or more external threads or thread segments 32. In the illustrated preferred embodiment of the invention, finish ring 24 includes an annular wall 34 from which threads 32 project. A tamper-indicating bead 36 extends radially outwardly from wall 34 beneath threads 32, and a capping or support flange 38 extends radially outwardly from wall 34 beneath bead 36. As an alternative, capping flange 38 can be molded onto preform neck 28. The inside diameter of finish ring wall 34 is less than the outside diameter of flange 30, and is less than the outside diameter of preform body 26.

Finish ring 24 is assembled to preform 22 employing a tapered anvil 40 (FIGS. 3-5). Anvil 40 has a nose 42 sized for close receipt within preform mouth 31, and a shoulder 44 for abutting engagement with the upper surface of flange 30. The upper portion of anvil 40 has a tapered

outer surface 46, preferably a conical outer surface, having a diameter at ledge 44 equal to or slightly greater than the outside diameter of flange 30, and an outside diameter at the remote end of surface 46 that is less than the inside diameter of finish ring 24. Finish ring 24 is pushed along surface 46 of anvil 40 resiliently to expand the diameter of the finish ring. When the finish ring is moved past flange 30, the finish ring resiliently contracts around neck 28 of preform 22. The relaxed diameter of ring 24 preferably is such that ring 24 is retained by interference fit on neck 28 after expansion over anvil 40 followed by contraction onto neck 28. Adhesive or ultrasonic welding can also be employed to enhance securement of ring 24 on preform 22. The finish and/or preform neck can be provided with suitable means for preventing rotation of the ring on the neck.

Preform 22 may be of any suitable plastic construction, such as monolayer PET or multilayer construction of PET layers alternating with layers of barrier resin such as ethylene vinyl alcohol (EVOH) or nylon. Preform 22 may be injection molded or compression molded. Likewise, finish ring 24 may be of injection or compression molded plastic construction. By providing finish ring 24 separate from preform 22, finish ring 24 may be of any desired material construction, either the same as or more preferably different from the material construction of preform 22. In other words, the material and conditions of fabrication of finish ring 24 may be selected separately from the material and manufacturing conditions of preform 22 to achieve desired operating characteristics at the finish area of the preform and the final container. Furthermore, the preform can be molded with thin wall sections without having to accommodate flow of material into a thicker finish area, which reduces material cost and mold cycle time. Finish ring 24 may be of polypropylene (PP) construction, which has sufficient resiliency to expand over anvil 40 and then "snap" or shrink back onto preform neck 28 and be secured by interference shrink fit on the preform neck. Polyester

material, such as PET, PEN or process regrind, can be stretched while warm over anvil 40, and will shrink back onto preform neck 28 as the ring cools.

There have thus been disclosed a preform assembly and method of manufacture that fully satisfy all of the objects and aims previously set forth. The invention has been disclosed in conjunction with a exemplary presently preferred embodiment thereof, and a number of modifications and variations have been described. Other modifications and variations will readily suggest themselves to persons of ordinary skill in the art. The invention is intended to embrace all such modifications and variations as fall within the spirit and broad scope of the appended claims.

**Claims**

1.

A preform assembly for blow molding a container, which includes:

a molded plastic preform (22) having an open mouth, a neck (28) surrounding said mouth with an external surface at a first diameter, an external flange (30) at one end of said neck surrounding said mouth, and a preform body (26) integrally molded with said neck at an end of said neck spaced from said flange, said body having a second external diameter greater than said first diameter, and

a circumferentially continuous molded plastic finish ring (24) externally secured to said neck between said flange and said body.

2.

The preform assembly set forth in claim 1 wherein said finish ring (24) is shrunk fit over said external surface of said neck (28).

3.

The preform assembly set forth in claim 2 wherein said finish ring (24) is of material construction selected from the group consisting of PP, PET, PEN and process regrind.

4.

The preform assembly set forth in claim 1 wherein said finish ring (24) has at least one external thread (32) and an external support flange (38) at one axial end of said ring.

5.

The preform assembly set forth in claim 1 wherein said plastic finish ring (24) is of a material construction selected from the group consisting of: PET, PP, PEN and process regrind.

6.

The preform assembly set forth in claim 1 wherein said plastic finish ring (24) is of a different material construction from said plastic preform (22).

7.

A method of making a preform assembly that includes the steps of:

(a) providing a molded plastic preform (22) that has an open mouth, a neck (28) surrounding said mouth with an external surface at a first diameter, an external flange (30) at one end of said neck surrounding said mouth, and a preform body (26) integrally molded with said neck at an end of said neck spaced from said flange, said body having a second external diameter greater than said first diameter,

(b) providing a circumferentially continuous molded plastic finish ring (24) externally secured to said neck between said flange and said body, and

(c) assembling said finish ring (24) to said preform (22) by locating said finish ring over said external surface of said neck and shrinking said ring onto said neck such that said ring is secured to said neck by interference shrink fit.

8.

The method set forth in claim 7 wherein said step (c) is carried out by resiliently expanding said ring (24) over said flange (30) and then allowing said ring to shrink onto said external surface of said neck (28).

9.

The method set forth in claim 8 wherein said step (c) is carried out by: (c1) positioning an anvil (40) over said mouth, said anvil having an outer surface (46) with a diameter at said flange (30) at least equal to that of said flange, and a diameter spaced from said flange less than the inside diameter of said ring, and (c2) expanding said ring (24) by sliding said ring along said outer surface until said ring snaps over said flange.

10.

A preform assembly made in accordance with the method set forth in claim 9.

11.

A preform assembly made in accordance with the method set forth in claim 7.

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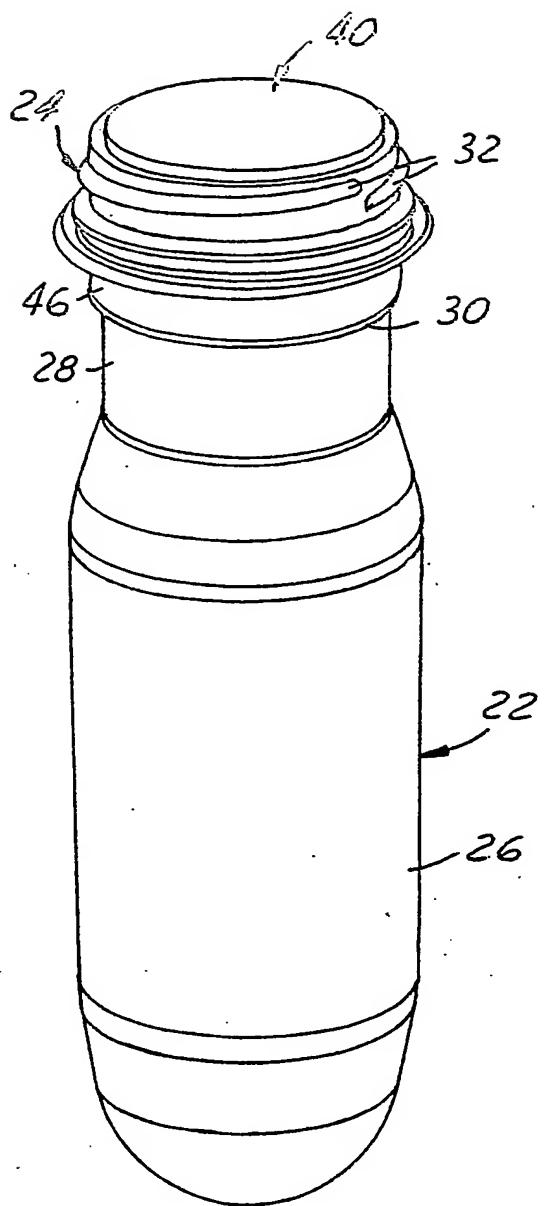


FIG. 4

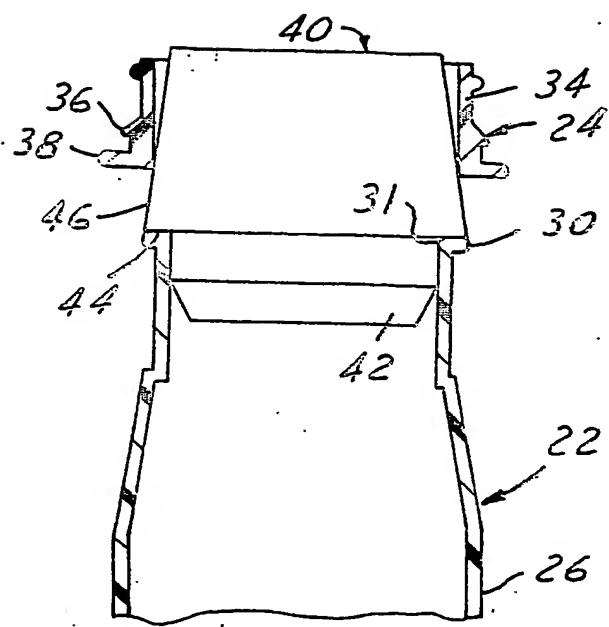


FIG. 5

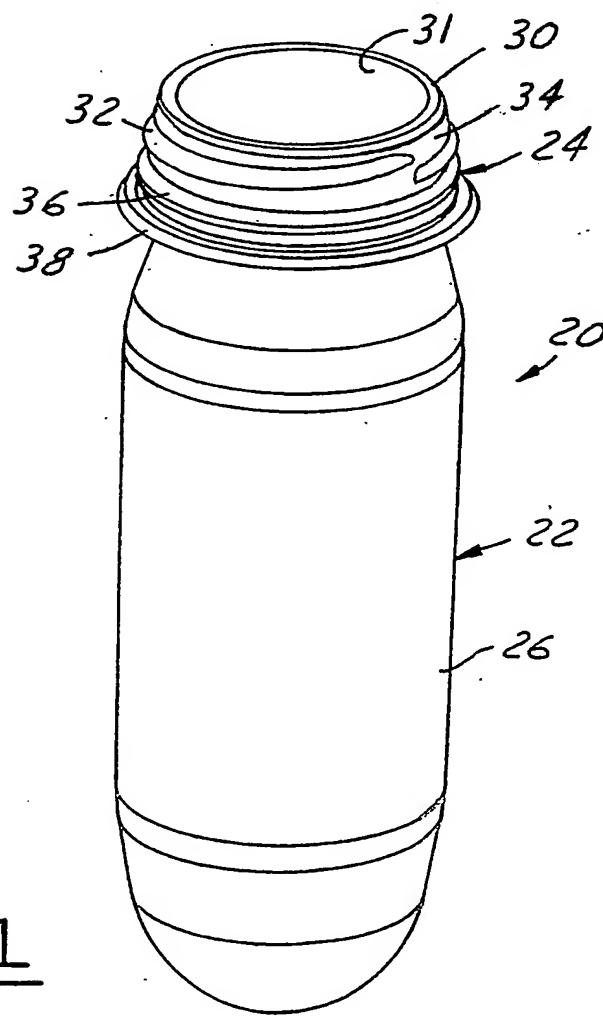
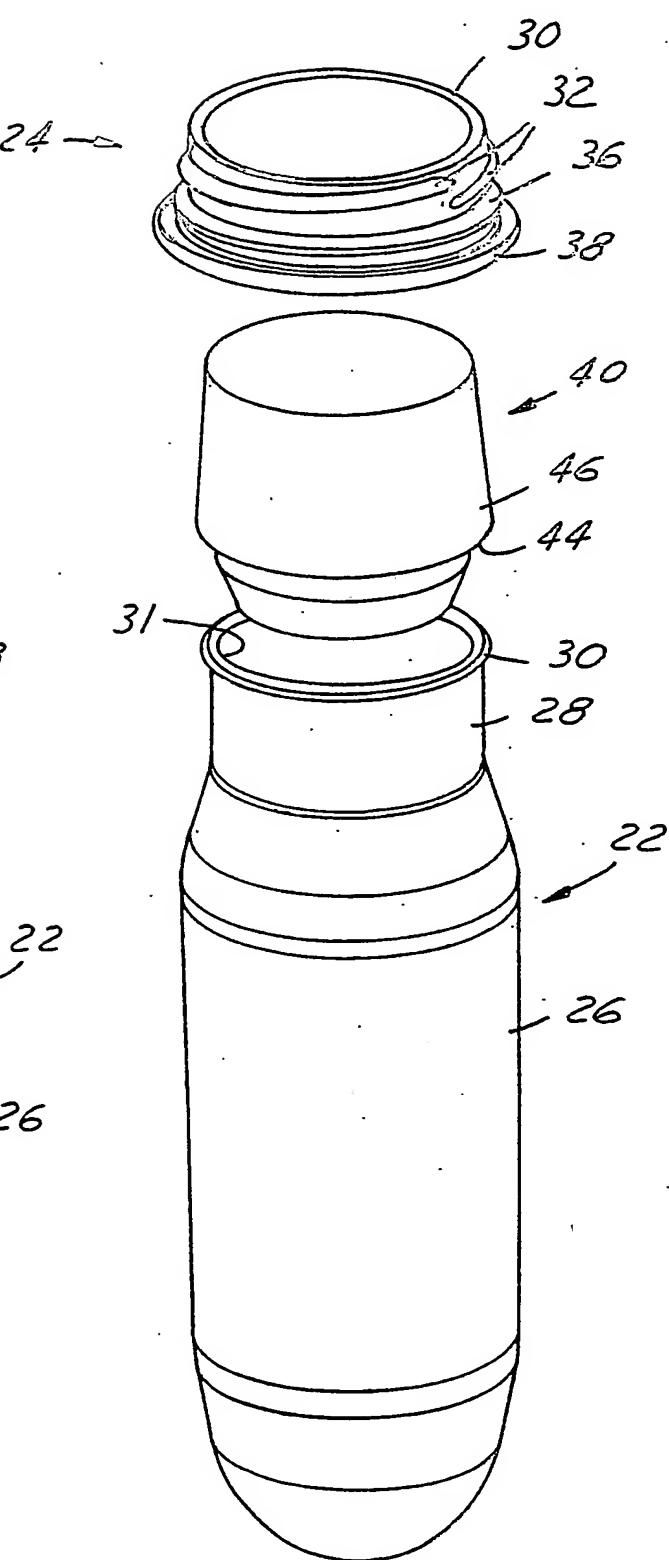
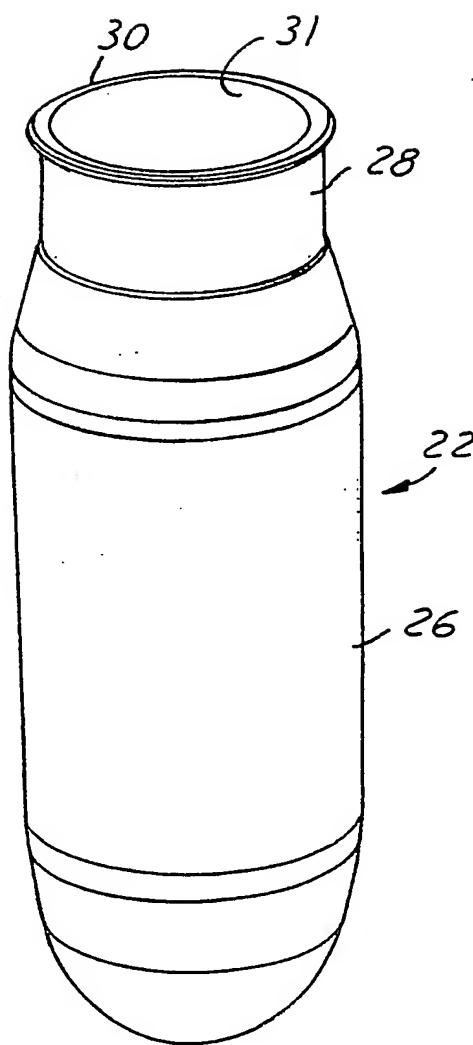


FIG. 1

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FIG. 2FIG. 3

## INTERNATIONAL SEARCH REPORT

PCT/US2004/005888

A. CLASSIFICATION OF SUBJECT MATTER  
 IPC 7 B65D1/02 B29C49/02

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
 IPC 7 B65D B29C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

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| Category ° | Citation of document, with indication, where appropriate, of the relevant passages  | Relevant to claim No. |
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 Further documents are listed in the continuation of box C. Patent family members are listed in annex.

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Information on patent family members

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